Vasily Grinevetsky – A Life and Activity

V. Tarabarin, K. Drozdov, and D. Bolshakova

Abstract In 2005, in the library of the Applied Mechanics room there were found 14 worksheets titled *Work Process of Steam Engine* by Professor V. Grinevetsky, Rector of Imperial Moscow Technical School (former name of the Bauman Moscow State Technical University). In the early years of Imperial Moscow Technical School (IMTS), the course of *Thermodynamics and Steam Engines* was lectured by the academic staff of its Applied Mechanics Department. Their research task was to trace Grinevetsky's career as a scientist and his relations with the Department of Applied Mechanics. This article describes the results of such research efforts.

Keywords Steam engine • Working procedure • Construction • History technique

1 Introduction

The time of Grinevetsky's life and work was a really hard period in the history of Russia. Russo-Japanese War and the 1905 Russian Revolution, World War I and the two revolutions of 1917 occurred in that period. At the same time, the world industry, transport and energy sectors were booming. Steam engines gave their place to internal combustion engines and electric motors, cars and aircrafts appeared. All of these events tightened requirements for the higher technical school, its graduates' educational attainment and its material and scientific resources. But actual conditions in Russia did not help meet such requirements.

The school suffered from insufficient and irregular financing; its academic staff and students were always distracted by war-related issues; classes were often interrupted and the training course was getting shorter and shorter.

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2 Biography of V.I. Grinevetsky

A future director and professor at IMTS, Vasily I. Grinevetsky was born on June 2, 1871 in Kyiv into a family of Ignaty F. Grinevetsky, a state councilor at railway administration and his wife Yekaterina V. Grinevitskaya, nee Zavoyko [1, 9]. Vasily's mother died when the little boy was 6 years old. His father was reassigned to Kremenchug where Vasily entered the Real School. In 1883, the Grinevetskys moved to Kazan where Vasily continued his training in the third form of the Real School. Learning came naturally to Vasily, and he spent all his free time on his self-education. Since the fifth form he became enamored of technical devices: he drew Volga steam ships, then he continued with water mills.

At his grandmother's estate, he built a fully functional roller mill. In 1889, Vasily Grinevetsky graduated from Kazan Real School. Having passed the competitive exams he entered Imperial Moscow Technical School (IMTS). Since this time, his life became inseparable from IMTS. In 1891, his father died and he was left with his sister. The early death of his parents determined Grinevetsky's way of life and his temper: he became very avoidant and spent all his power and abilities on science (Fig. 1).

In 1896, Grinevetsky graduated from IMTS and continued his work there as a lecturer in *Machine Parts and Engineering* at the Department of Mechanics. V.I. Grinevetsky's career as a lecturer had successful start. In 1900, on summer vacation, the Minister of People's Education sent Grinevetsky on a 2-month business trip to the World Fair in Paris "for studying purposes". IMTS exhibited its students' works made in workshops using model drawings and tools, steam engine made in the School including all lab research accessories, course and graduation works in different disciplines, printed works, statistical surveys and IMTS news bulletins. The IMTS exposition won the Grand Prix award. During his trip Vasily Grinevetsky learned the studying and teaching process in foreign universities raising one question: why German technical devices are better?

Fig. 1 V.I. Grinevetsky 1871–1919

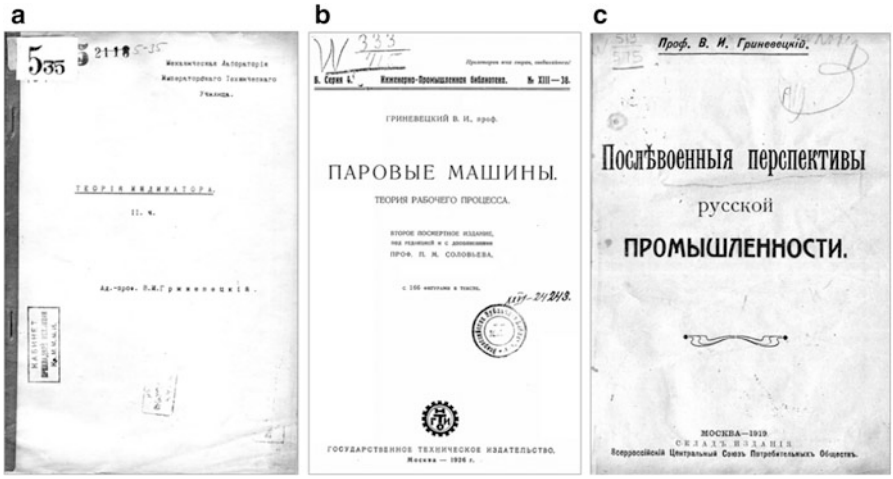

Fig. 2 Title page of differential works of Grinevetsky ((**a**) Theory of the indicator, (**b**) steam engines. Theory of work process [6], (**c**) postwar outlook for the Russian Industry [5])

In 1902 Grinevetsky became a professor of the Applied Mechanics and Engineering Department. Let's quote Grinevetsky's testimonial for that position: "We are bound in honor to recommend the Faculty of Mechanics to admit to the position of *Applied Mechanics and Engineering Professor* a mechanic engineer, V.I. Grinevetsky who is well-known in the scientific circles as a scientist, talented engineer, popular and reputable pedagogue who gave his country a great number of talented followers, and finally as an experienced, thoughtful specialist and advisor" (Fig. 2).

His first period of individual scientific efforts was devoted to the work processes of steam engines. He prepared a number of lecture courses in steam engines that constituted the basis for his unfinished work titled *The Theory of Steam Engines*. The first part of this work *The Theory of Work Process* was published under the editorship of professor P.M. Solovyov after Grinevetsky's death [2]. Grinevetsky was one of those who introduced and lectured the course in *Internal-Combustion Engines* (ICE). He developed a thermal calculation method for such engines that had been used for many years as a design basis for ICEs. Based on the principles of technical and economic analysis, Grinevetsky developed an advanced training course in *Heating and Power Stations* for engineers.

Grinevetsky was one of the pioneer locomotive engineers in Russia. In 1906, he developed a vehicular internal-combustion engine. On the basis of such engine the Grinevetsky locomotive was developed.

In addition to pedagogics and technologies, Grinevetsky was much interested in economic development in Russia. Two of his works [3, 4] were dedicated to the development of the Russian industry during and after the World War I.

In 1905, Vasily Grinevetsky was appointed Deputy Director of IMTS. Working in his capacity, Grinevetsky paid great attention to the organization and improvement of educational processes, development of higher polytechnic school, and establishment of subject-based studying [5–7]. Upon professor A.P. Gavrilenko's death in 1914, Grinevetsky was appointed Director of IMTS. After the February Revolution, on March 6, 1917, IMTS was reorganized as Moscow Higher Technical School, and on May 17, V.I. Grinevetsky was elected its Rector. He worked in this capacity until 1918. In summer, he left for his estate and sent his resignation as Rector from then. In spring 1919, Grinevetsky caught typhus fever and died on March 31 in Yekaterinoslavl where he was buried.

3 Grinevetsky's Works on Mechanic Engineering

The lectures of IMTS professors were usually published by lithography in a number of copies sufficient for all students. The text of such lectures was typed by a calligrapher and then checked and endorsed by the lecturer who wrote them. Simple diagrams and figures were put just into the text. Complicated drawings and figures were often published as a separate album or worksheet. The texts of such lectures survived through the present days, but drawing albums have been essentially lost. That's why the Work Process of Steam Engine worksheets by Grinevetsky found in the Applied Mechanics room are of great historical interest.

In 2005, 14 worksheets titled *Work Process of Steam Engine* by Professor V. Grinevetsky were found by assistant Sashenko D. in the library of the Applied Mechanics. These worksheets were made at I. Maslov's drawing workshop. Such workshops drawing of high quality are based on the lecturer's sketches. Using such originals, lithographers of I.N. Kushnerov & Co. Partnership printed the worksheet copies. Let's see the contents of these worksheets. Worksheets 1 (Fig. 3a) and 2 (Fig. 3b) include the design drawings of different steam engines: a vertical quadruple expansion marine steam engine (worksheet 1, drawings 6–8), a vertical single-cylinder high-speed engine manufactured by Gustav List's factory (worksheet 1, drawings 1–4), a horizontal tandem-compound valve engine manufactured by Sulzer (worksheet 2, drawings 4–6), a horizontal single-cylinder superheated steam engine by Dingler (worksheet 2, drawings 1–3), valve control mechanism by Sulzer (worksheet 2, drawing 7).

Worksheet 3 (Fig. 4a) includes 18 different figures: theoretical indicator diagram and its legend, indicators, refrigerator, Prony brake, rotary lobe pump, etc. Worksheet 4 (Fig. 4b) contains pictures outlining the history of steam engine development. Worksheets 5–7 include the examples of pilot indicator diagrams for different steam engines and the methods of constructing theoretical indicator diagrams for condensing and non-condensing engines (worksheet 5, drawing 23; worksheet 6, drawing 16). Worksheet 6 is shown on Fig. 4d, others worksheets in the paper is not presented in the article.

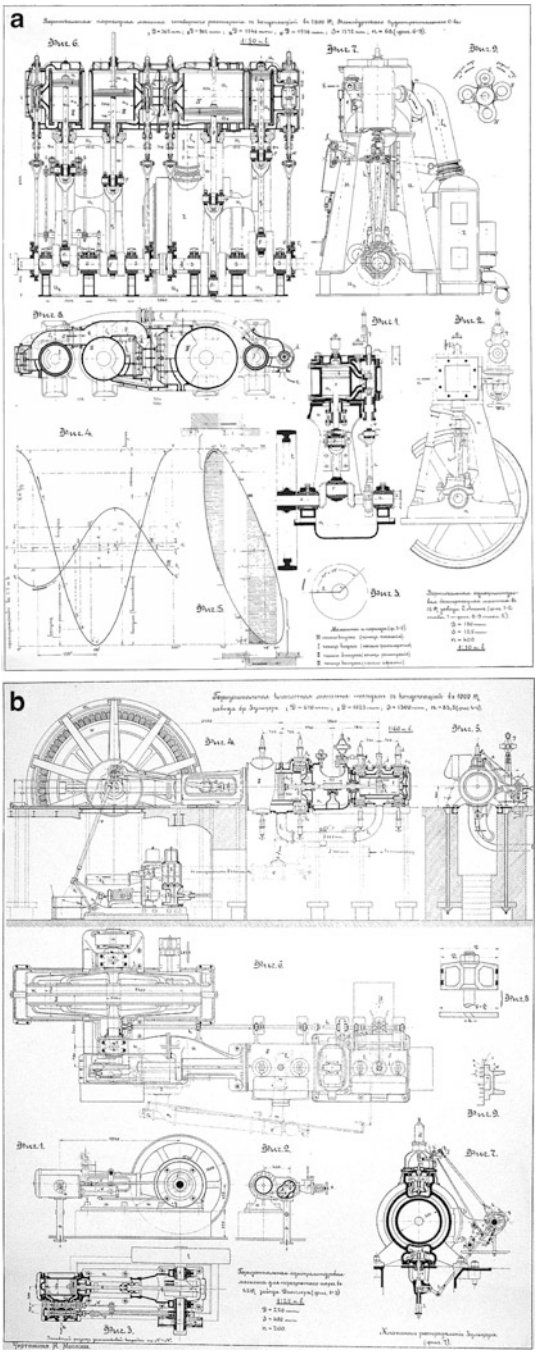

Fig. 3 Examples of the worksheets by Grinevetsky (worksheets 1 and 2)

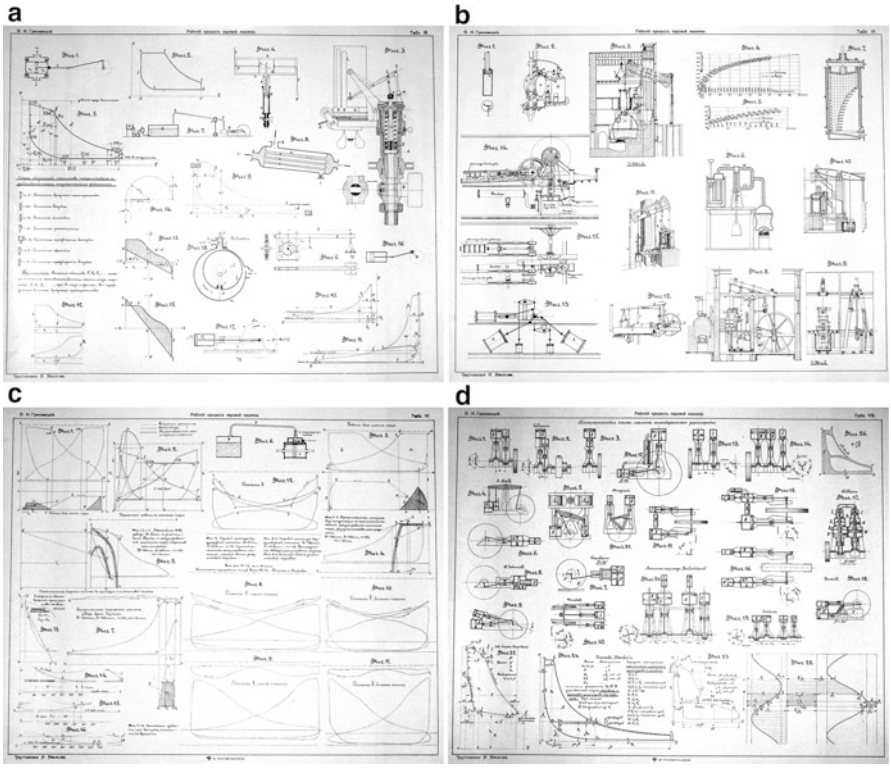

Fig. 4 Examples of the worksheets by Grinevetsky (worksheets 3(a), 4(b), 6(d), and 8(c))

Worksheet 8 (Fig. 4c) shows 19 kinematic diagrams of multiple expansion steam engines and four figures with the examples of constructing theoretical indicator diagrams.

Worksheets 10–14 include the examples of experimental indicator diagrams and the methods of approximated graphical construction of theoretical diagrams for different steam engines. Comparing the pictures in the worksheets and the pictures of the work [2] one can see that most pictures coincide with each other in part or in whole. This proves our assumption that the worksheets constitute graphic illustrations for Grinevetsky's course on Work Process of Steam Engine. Now it is stored in the Cabinet of Applied Mechanics at the TMM Department of Bauman MSTU.

In his work titled The Locomotive Problem and Its Significance for Russia [8] Grinevetsky describes different locomotive designs and comparative characteristics thereof. Here is the description of Grinevetsky's engine and locomotive. On October 13, 1906, Grinevetsky patented his engine (Fig. 5).

In this engine a motive cycle was successively performed in three cylinders: the first one provided preliminary air compression, the second one provided fuel

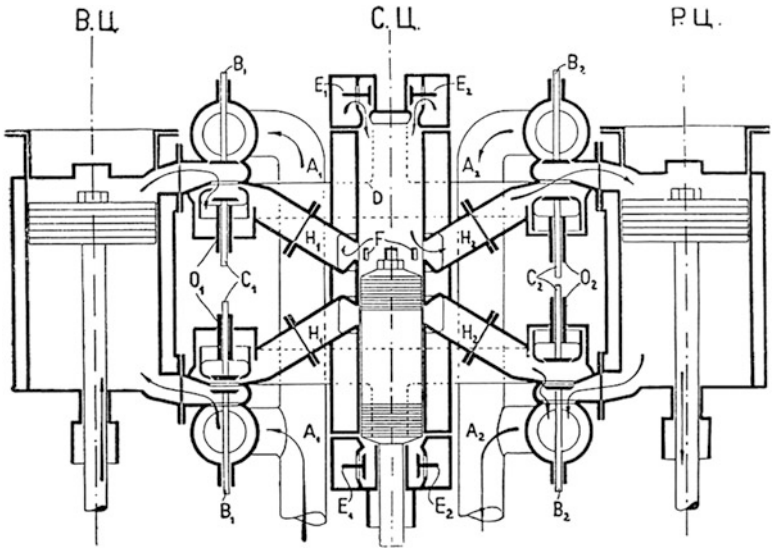

Fig. 5 Grinevetsky's engine

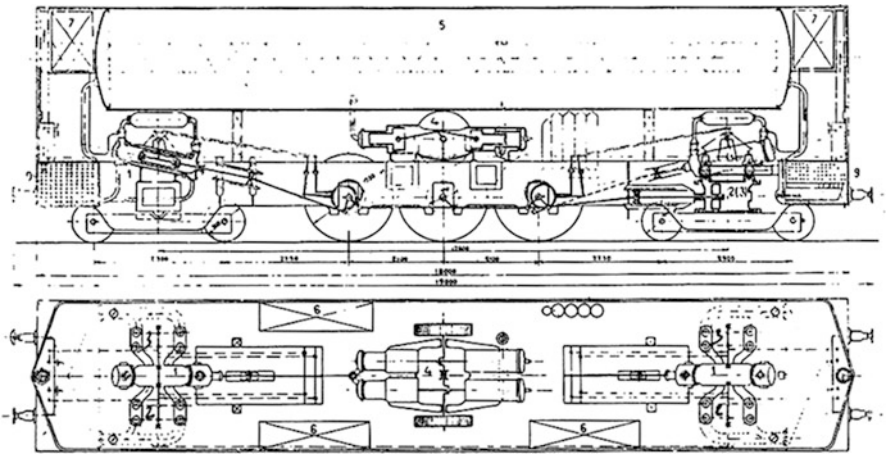

Fig. 6 Grinevetsky's locomotive

combustion and the third one provided gas expansion ensuring useful yield. A pilot model of such engine was developed and tested to provide stable yield at low rotation speed (about 120 rpm). In 1914–1916, professor Grinevetsky and engineer Oshurkov designed a goods and passenger locomotive (Fig. 6) powered by such engine.

4 Conclusions

A professor and the rector of Moscow Higher Technical School V.I. Grinevetsky dedicated all his life to science and scholastic activities. He greatly contributed to the improvement of higher education by introducing subject-based teaching system. He established *Moscow School of Combustion Engineers*, and in 1921 it was reorganized as *V.I. Grinevetsky and K.V. Kirsh Institute of Combustion Engineering*. His works in the sphere of economic analysis in Russia have largely determined the development of industry in 1920s and 1930s of the last century. The paper presents *V.I. Grinevetsky's* career as a scientist and his relations with the *Department of Applied Mechanics*. It also contains a list of figures of the *V.I. Grinevetsky´*s original drawings, that were found and studied.

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